25/2 2025

No

Date

Aproksimasi sterling

$\ln N! = ?$

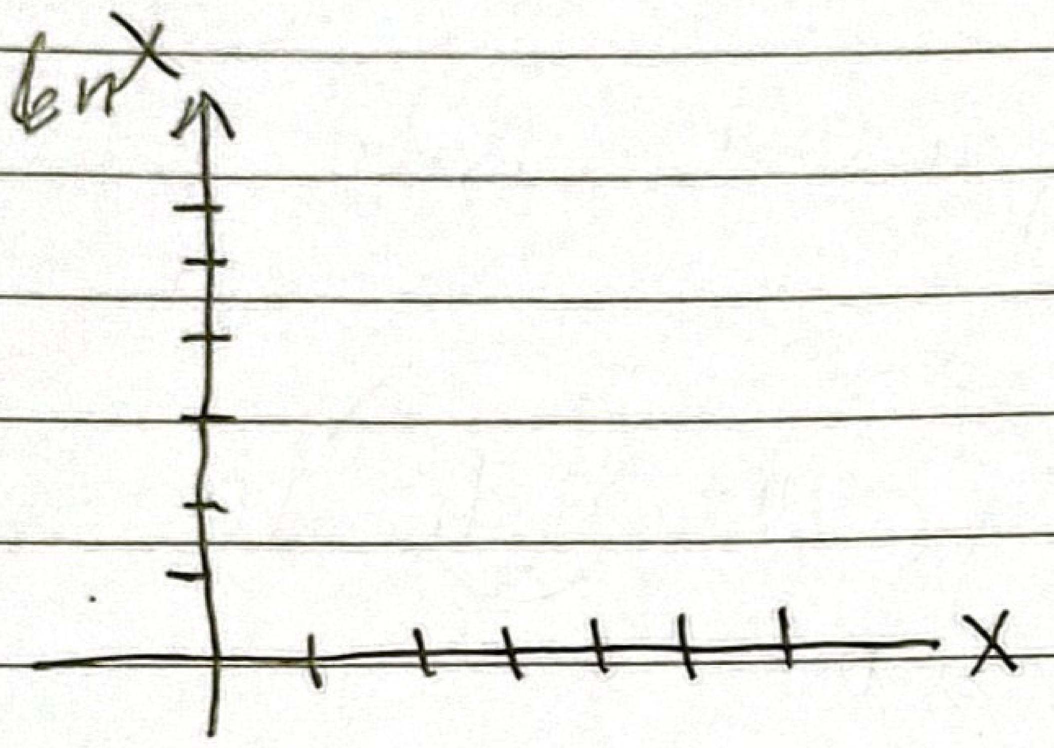
$N! = 1.2.3.4 \ldots\ldots N$

$\ln N! = \ln 1 + \ln 2 + \ln 3 + . + \ln N$

$= \sum_{x=1}^{N} \ln x$

untuk menjawab hal tersebut diatas, sterling membuat grafik

Persamaan sterling



$l_1 = 0$

x	ln x
1	
2	
3	
4	
5	
6	

Jika $l_1 = 0$

$l_1 = 0.6$

$\ln 3 = 1$

$\ln 4 = 2$

$\ln 5 = 3$

angka $\ln 5! =$

$\ln N! = \sum_{x=1}^{N} \ln x$

$= \int_1^N \ln x \, dx$

$\int_a^b v\,dv = uv\Big|_a^b \int_a^b v\,du$

Misal : $v = \ln x$ $\quad dv = dx$

$dv = \frac{1}{x} dx$ $\quad v = x$

Maka : $x \ln x \Big|_1^N - \int_1^N x \frac{1}{x} dx$

$= (N \ln N - 0) - (N - 1)$

$\ln N! = N \ln N - N + 1$

Untuk $N \gg 1$ ($N \approx 1000$), maka

$\int_1^N \ln x \, dx = \ln N! = N \ln N - N$

$\int$ = Integral

! = Faktorial

∞ = Tak terhingga

θ = sin

hal yg harus diingat !

$\frac{1}{e+v} + \frac{1}{e-v}$

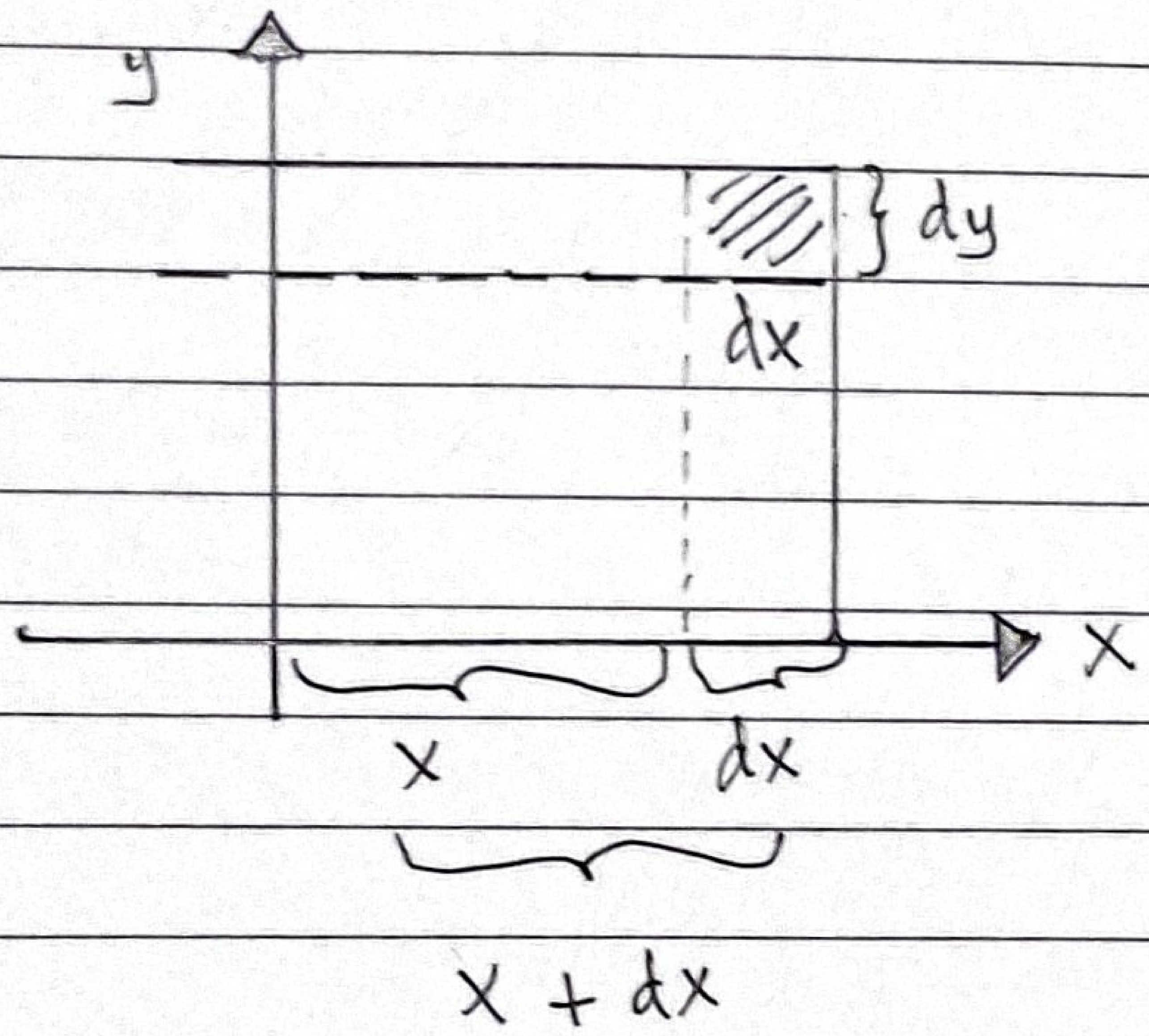
$= \frac{(c+v)+(c-v)}{c^2 - cv + cv - v^2} = \frac{(c+v)+(c-v)}{c^2-v^2} = \frac{2c}{c^2-v^2}$

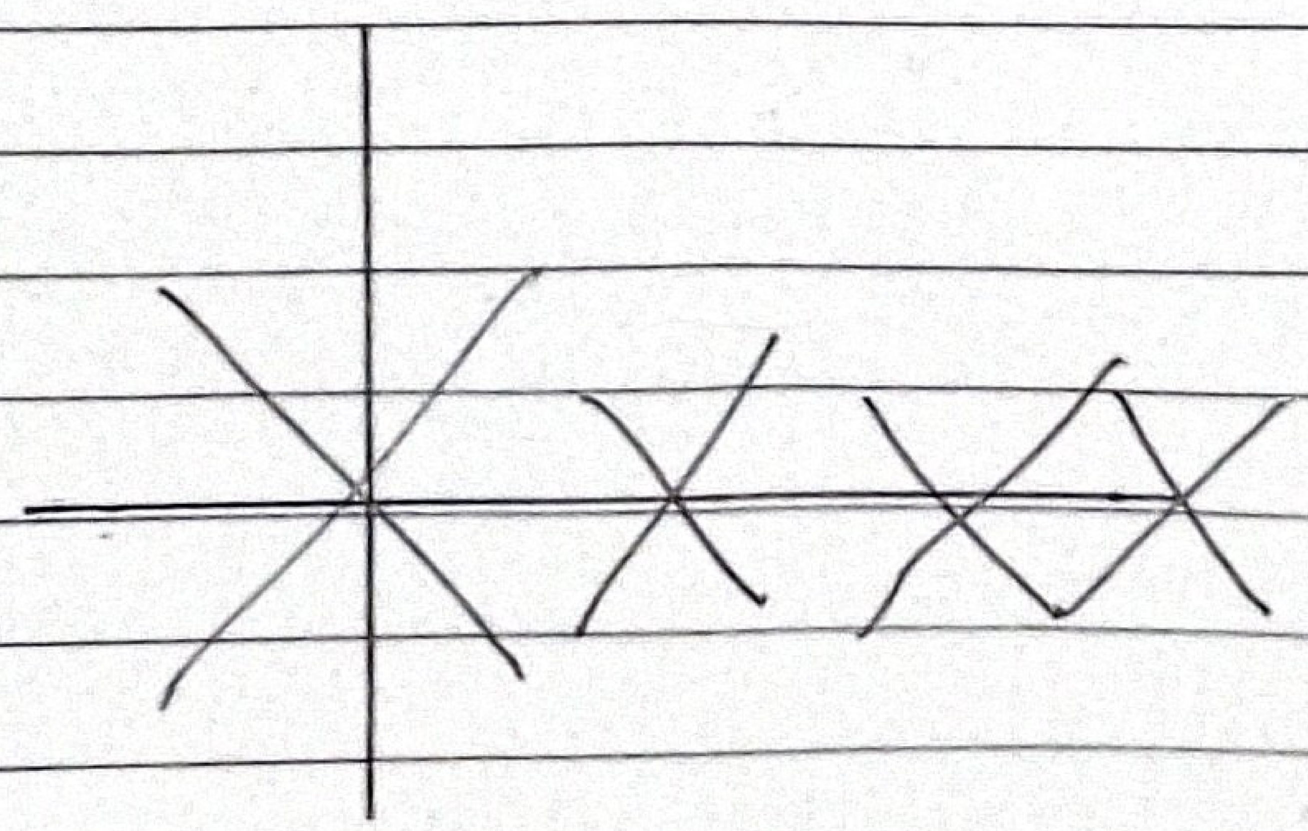
$$\int_{-\infty}^{\infty} e^{-ax^2} dx = ?$$

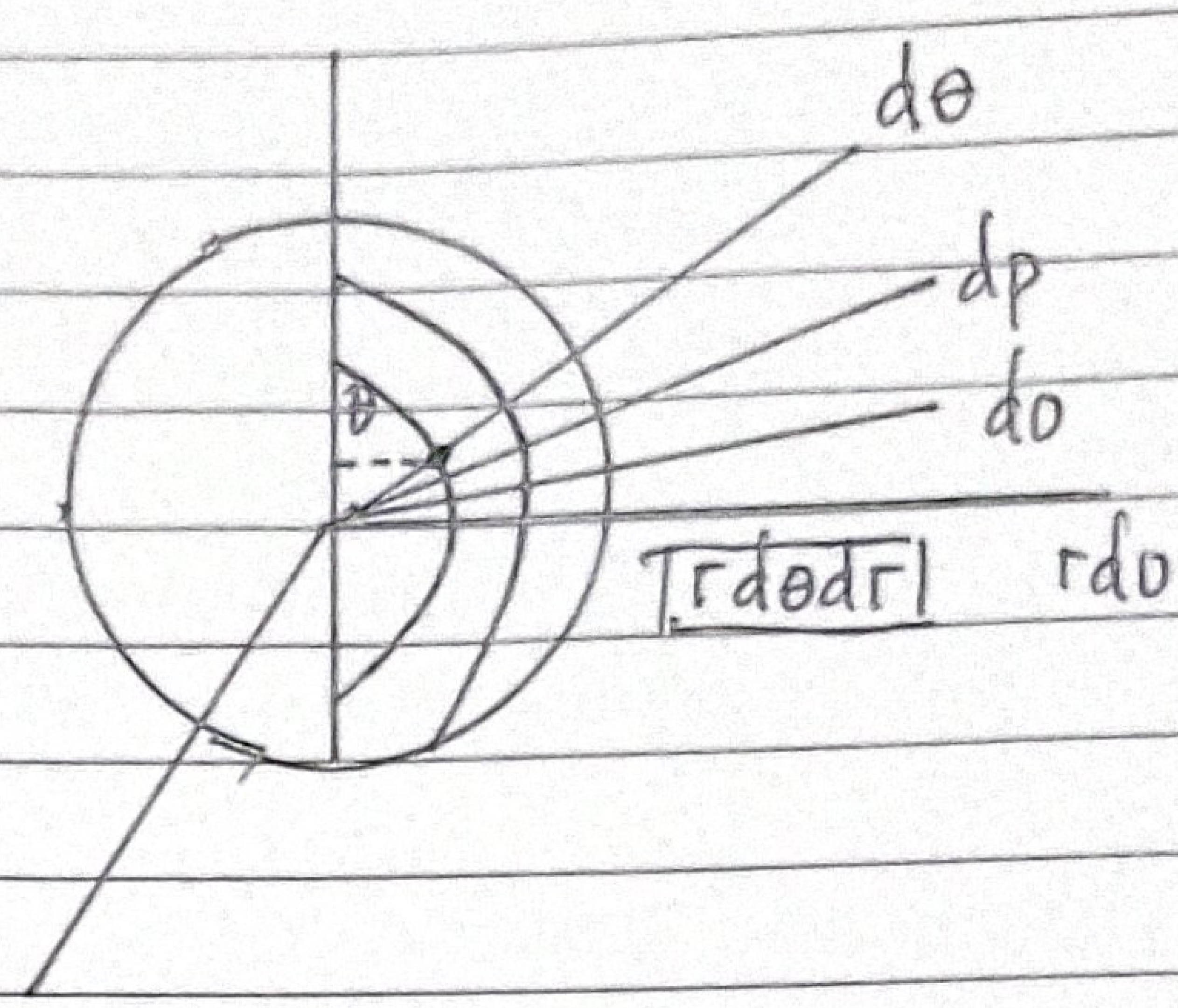
$$\int_{-\infty}^{\infty} e^{-ax^2} dx = 1$$

$$\int_{-\infty}^{\infty} e^{-ay^2} dy = 1$$

$$\int_{-\infty}^{\infty}\int_{-\infty}^{\infty} a(x^2+y^2)\, dx\, dy = 1^2$$







$$\int_{-\infty}^{\infty}\int_{-\infty}^{\infty} a^{-(x^2+y^2)}\, dx\, dy = \int_{0}^{2\pi} d\theta$$

$$\int_{r=0}^{\infty}\int_{\theta=0}^{2\pi} e^{-ar^2}\, r\, dr\, d\theta$$

$r = 0 \ \theta = 0$

$$2\pi \int_{0}^{\infty} e^{-ar^2}\, r\, d(r)$$

$$= \frac{2\pi}{2a} \int_{0}^{\infty} e^{-ar^2}\, d(ar^2) = \frac{2\pi}{2\pi}$$

$$\left[-e^{-ap^2} \Big|_{0}^{\infty} \right]$$

$$\int_{0}^{\infty} e^{-x} dx = \begin{matrix} -e^{-x}(dx) \\ -e^{-ar^2} d(ar^2) \end{matrix}$$

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$\pi^2 = \frac{\pi}{a}$

$I = \sqrt{\frac{\pi}{a}}$

$$\frac{d}{da}\int_{-\infty}^{\infty} e^{-ax^2}\,dx = \frac{d}{dy}\left[\sqrt{\frac{\pi}{a}}\right]$$

$$\int_{-\infty}^{\infty} e^{-ax^2}\,dx = \frac{d}{da}\sqrt{\frac{\pi}{a}}$$

$$\int_{-\infty}^{\infty} x^2 e^{-ax^2}\,dx = \frac{d}{da}\sqrt{\frac{\pi}{a}}$$

$$= \sqrt{\pi}\,\frac{d}{da}\left(a^{-\frac{1}{a}}\right)$$

$$\int_{-\infty}^{\infty} x^2 e^{-ax^2}\,dx = \sqrt{\pi}\left(-\frac{1}{2}a^{-3/2}\right)$$

$$\int_{-\infty}^{\infty} x^2 e^{-ax^2}\,dx = \frac{1}{2}\sqrt{\frac{\pi}{a^3}}$$